

WHAT IS CLAIMED IS:

1. A control apparatus for a lock-up clutch of a vehicle having a hydraulic torque transfer device equipped with the lock-up clutch between a power source and an automatic transmission, for controlling a hydraulic pressure of a hydraulic oil supplied to the lock-up clutch when the lock-up clutch is in a slip region, comprising:

a hydraulic oil temperature determining unit that determines whether an oil temperature of the hydraulic oil is lower than a predetermined temperature;

an input torque change calculating unit that calculates a change in input torque of the lock-up clutch;

an input torque change determining unit that determines whether the change in the input torque calculated by the input torque change calculating unit is larger than a predetermined value; and

a hydraulic pressure changing unit that changes the hydraulic pressure of the hydraulic oil supplied to the lock-up clutch to a predetermined pressure for a predetermined length of time, when the hydraulic oil temperature determining unit determines that the oil temperature of the hydraulic oil is lower than the predetermined temperature and the input torque change determining unit determines that the change in the input torque is larger than the predetermined value.

2. The control apparatus according to claim 1, wherein the hydraulic pressure changing unit changes the predetermined length of time according to the change in the input torque calculated by the input torque change calculating unit.

3. The control apparatus according to claim 2, wherein the hydraulic pressure changing unit changes the predetermined length of time according to the oil temperature of the hydraulic oil.

4. The control apparatus according to claim 3, further comprising a target slip speed change rate calculating unit that calculates a rate of change of a target slip speed of the lock-up clutch,

wherein the hydraulic pressure changing unit changes the predetermined length of time according to the rate of change of the target slip speed.

5. The control apparatus according to claim 1, wherein the hydraulic pressure changing unit changes the predetermined length of time according to the oil temperature of the hydraulic oil.

6. The control apparatus according to claim 1, further comprising a target slip speed change rate calculating unit that calculates a rate of change of a target slip speed of the lock-up clutch,

wherein the hydraulic pressure changing unit changes the predetermined length of time according to the rate of change of the target slip speed.

7. The control apparatus according to claim 1, wherein the input torque change calculating unit comprises at least one of an input torque change amount calculating unit that calculates an amount of change of the input torque within a predetermined time, and an input torque change rate calculating unit that calculates a rate of change of the input torque.

8. The control apparatus according to claim 7, wherein the input torque change amount calculating unit calculates an amount of change of a throttle opening within the predetermined time, and the input torque change rate calculating unit calculates a rate of change of the throttle opening.

9. The control apparatus according to claim 8, wherein the input torque change determining unit determines whether the amount of change of the throttle opening within the predetermined time is larger than a predetermined value.

10. A control method for a lock-up clutch of a vehicle having a hydraulic torque transfer device equipped with the lock-up clutch between a power source and an automatic transmission, for controlling a hydraulic pressure of a hydraulic oil supplied to the lock-up clutch when the lock-up clutch is in a slip region, comprising the steps of:

determining whether an oil temperature of the hydraulic oil is lower than a predetermined temperature;

calculating a change in input torque of the lock-up clutch;

determining whether the change in the input torque is larger than a predetermined value; and

changing the hydraulic pressure of the hydraulic oil supplied to the lock-up clutch to a predetermined pressure for a predetermined length of time, when it is determined that the oil temperature of the hydraulic oil is lower than the predetermined temperature and that the change in the input torque is larger than the predetermined value.

11. The control method according to claim 10, wherein the predetermined length of time is changed according to the change in the input torque.

12. The control method according to claim 11, wherein the predetermined length of time is changed according to the oil temperature of the hydraulic oil.

13. The control method according to claim 12, further comprising the step of calculating a rate of change of a target slip speed of the lock-up clutch,

wherein the predetermined length of time is changed according to the rate of change of the target slip speed.

14. The control method according to claim 10, wherein the predetermined length of time is changed according to the oil temperature of the hydraulic oil.

15. The control method according to claim 10, further comprising the step of calculating a rate of change of a target slip speed of the lock-up clutch,

wherein the predetermined length of time is changed according to the rate of change of the target slip speed.

16. The control method according to claim 10, wherein the change in the input torque is calculated by calculating at least one of an amount of change of the input torque within a predetermined time and a rate of change of the input torque.

17. The control method according to claim 16, wherein the amount of change of the input torque is calculated by calculating an amount of change of a throttle opening within the predetermined time, and the rate of change of the input torque is calculated by calculating a rate of change of the throttle opening.

18. The control method according to claim 17, wherein the step of determining whether the change in the input torque is larger than the predetermined value comprises determining whether the amount of change of the throttle opening within the predetermined time is larger than a predetermined value.